RESEARCH, DEVELOPMENT & TECHNOLOGY TRANSFER
QUARTERLY PROGRESS REPORT

Wisconsin Department of Transportation
DT1241 02/2011

INSTRUCTIONS:
Research project investigators and/or project managers should complete a quarterly progress report (QPR) for each calendar quarter during which the projects are active.

WisDOT research program category: ☐ Policy research ☒ Wisconsin Highway Research Program ☐ Other ☐ Pooled fund TPF#		Report period year: 2011 ☐ Quarter 1 (Jan 1 – Mar 31) ☒ Quarter 2 (Apr 1 – Jun 30) ☐ Quarter 3 (Jul 1 – Sep 30) ☐ Quarter 4 (Oct 1 – Dec 31)
Project title: Effective Depth of Soil Compaction in Relation to Applied Compactive Energy – Fine-Grained Soil Supplement Project		
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WisDOT project ID: 0092-08-11	Other project ID:	Project start date: 10/10/2007
Original end date: 2/10/2009	Current end date: 9/30/2011	Number of extensions: 3

Project schedule status:
☐ On schedule ☐ On revised schedule ☐ Ahead of schedule ☒ Behind schedule

Project budget status:

Total Project Budget	Expenditures Current Quarter	Total Expenditures	% Funds Expended	% Work Completed
$103,914.00	$7,135.31	$92,775.73	89%	80%

Project description:

The Wisconsin Department of Transportation has requested the evaluation of appropriate lift thickness for embankment construction under common compactors equipment used in Wisconsin. The lift thickness has direct engineering and economic implications in the design, construction and performance of geotechnical systems such as embankment, foundations and roads construction. The Geological Engineering research group at University of Wisconsin has proposed a series of experimental tests to monitor the compaction effort applied and how the soil properties varied with it. In addition, field monitoring of the compaction process will be performed during the next summer season. Data collected taken from the experimental tests and the field monitoring, recommendation of appropriated lift thickness will be given considering type of soil and compactor equipment.

The proposed work plan complements the study performed on the evaluation of effective depth of compaction on coarse-grained soils. This study will collect and evaluate data from actual embankment construction operations to evaluate the effective depth of compaction on fine-grained soils.

The proposed work plan will be divided in three phases:

I. Evaluation of the response and effect of compaction operations in fine-grained soils
II. Establish correlations between experimental data and theoretical/numerical predictive models
III. Draft recommendations for optimum lift thickness in Wisconsin embankment construction for coarse and fine-grained soils

Progress this quarter (includes meetings, work plan status, contract status, significant progress, etc.):

During the past three quarters, an experimental laboratory program was designed, built tested and corrected. Several codes in Matlab were written to analyze and interpret laboratory data. For these laboratory tests, two types of soil were selected in order to be monitored under compaction for different lift thicknesses. One soil is well-graded sand with silt and the other soil is silt. Laboratory tests consist in monitoring the compaction effort applied to the soil and while physical (i.e., density and water content) and mechanical properties (i.e., stiffness and strength) of the compacted soils were measured using both destructive and non-destructive testing techniques for each soil at different lift thickness, compactive effort and water content.

Laboratory tests were performed and analyzed in order to verify the performance and the reliability of the testing methodology. Based on these results, the procedure of the proposed tests were modified and corrected to better accomplish the objectives of the research project. Using the corrected proposed methodology, a total of 12 tests were performed and the data analyzed. Results show the effect of compaction energy (by monitoring the number of passes of the compactor), lift thicknesses, and initial moisture content on both the obtained density at the surface and depths. These laboratory experimental results show the expected responses of compacted lifts under controlled conditions. These results will allow evaluating the responses of compacted lifts in the field.

Anticipated work next quarter:

The anticipated work for next quarter will consist in to finish the second set of tests at laboratory scale and analyze all the laboratory data in order to correlate the lift thickness with the molding water content and soil type at laboratory scale and to extrapolate to field conditions.

The experimental and analysis procedures developed both, in the field for the original project and in the laboratory in the supplement part of the project will be used on the data collection and interpretation of the data collected in the field during this summer.

We will meet with DOT officials to coordinate the field data collection part of the project. It is expected that the field testing will begin this quarter.

Circumstances affecting project or budget:

We really need to get access to a field site during the construction season. We are working with WisDOT officials to make sure we can complete the data collection. We will be requesting a no-cost extension to complete the field testing.

Attach / insert Gantt chart and other project documentation

Phase I - Evaluation of the response and effect of compaction operations on actual embankment construction operations
Phase II - Theoretical/numerical and experimental evaluation of compaction efforts
Phase III - Establish correlations between experimental data and theoretical/numerical predictive models
Phase IV - Draft recommendations for optimum lift thickness
Phase V – Final Report

Table 1: Project time schedule

Phase Number	1.25 Years (15 months)				
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 5
Phase I	X	X		X (if required)	
Phase II		X	X	X	
Phase III		X	X		

Phase IV					X

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Staff receiving QPR:	Date received:
Staff approving QPR:	Date approved: